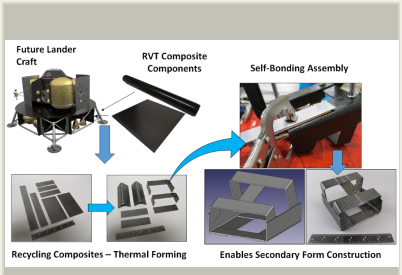
Small Business Innovation Research/Small Business Tech Transfer

Reclaimable Thermally Reversible Polymers for AM Feedstock, Phase II

Completed Technology Project (2017 - 2019)

Project Introduction

CRG proposes to continue efforts from the 2016 NASA SBIR Phase I topic H5.04 Reclaimable Thermally Reversible Polymers for AM Feedstock. In Phase II, CRG will refine the thermally-reversible polymeric materials for function as reprocessable thermosetting matrixes, and evaluate improved reclamation and additive manufacturing (AM) related processing methods for prototype demonstrations. These materials and processes enable reclamation and repurposing of structural fiber-reinforced composites into new configurations during extraterrestrial missions, such as conversion to Additive Manufacturing (AM) feedstocks or direct fabrication into multipart constructs. The thermally-reversible thermosets also present the opportunity to generate volumes of AM feedstock through function as a binder matrix, allowing compounding and impregnation/infusion of in-situ resources such as environmentally sourced metallic, mineralogical (i.e. regolith), and desized/milled non-reprocessable composites. This approach will provide NASA with a means to support in-situ resource utilization with a reduced reliance on pristine raw material payloads. CRG has already demonstrated the efficacy of thermally-reversible polymer structures in commercial adhesive applications, as well as in previous NASA technical efforts for modifying waste packaging plastics to provide improved compatibility to AM processing (NASA SBIR H14.03-9603), and in the feasibility demonstration of the Phase I effort of this project. The proposed concept not only has the potential to enable resource reclamation and AM capability, but also to advance the state-of-the-art in AM materials technology. CRG's proposed approach to develop thermally-reversible polymer materials for thermoset polymer reprocessing, and demonstration of reclamation and manufacturing compatibility evaluation, will provide NASA with a material and processing technology readiness level (TRL) of 5 at the conclusion of the Phase II effort.



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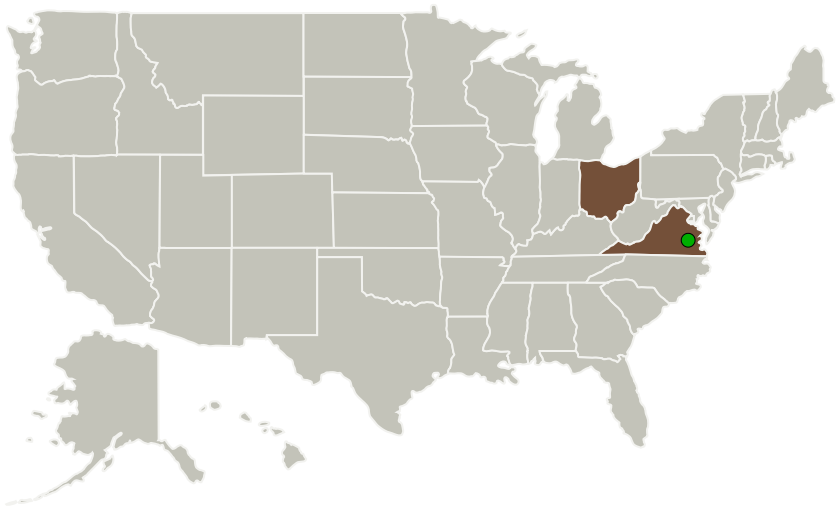
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Cornerstone Research Group, Inc.	Lead Organization	Industry	Miamisburg, Ohio
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Ohio	Virginia

Project Transitions

April 2017: Project Start

April 2019: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140941)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Cornerstone Research Group, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

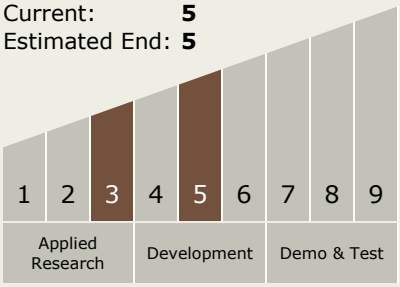
Carlos Torrez

Principal Investigator:

Brian E Henslee

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



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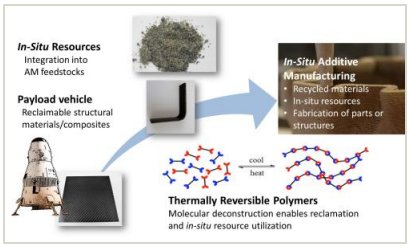
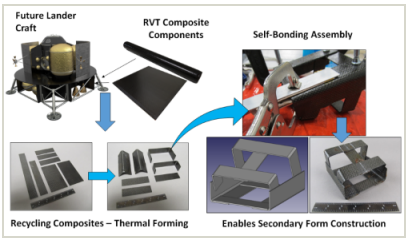
Images



Briefing Chart Image
Reclaimable Thermally Reversible Polymers for AM Feedstock, Phase II Briefing Chart Image *(https://techport.nasa.gov/image/135469)*



Final Summary Chart Image
Reclaimable Thermally Reversible Polymers for AM Feedstock, Phase II *(https://techport.nasa.gov/image/136551)*

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.4 Manufacturing
    - TX12.4.6 Repurpose Processes

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System